GEOGRAPHIC SCHOOL BULLETINS

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VOLUME XXXVI, NUMBER 13, JANUARY 13, 1958 . . . *To Know This World, Its Life*

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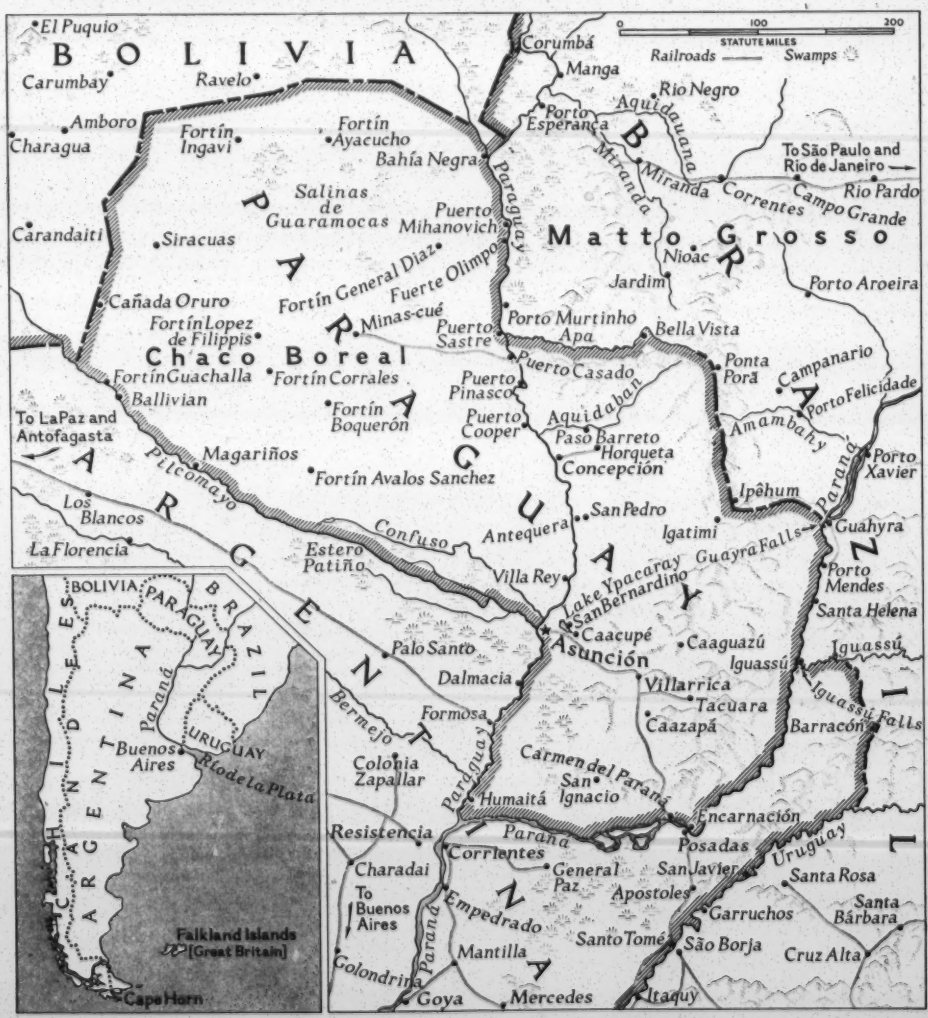
Next Week: **Find the bones of the *Bounty* at Pitcairn Island, with the *National Geographic Magazine's* adventuring writer-photographer, Luis Marden.**

Spanish cave-wife steps into the warm Andalusian sun to do her Monday wash (pages 150-151).

JACK MANNING PIX

barefoot women with loads on their heads shuffle leisurely on shaded streets. Soft accents of Guaraní Indians mingle with Spanish among the population of 206,000. The capital is shaped in regular squares. Street cars clang along paved thoroughfares. Railway cars grumble away, connecting Asunción with Buenos Aires. A cathedral and many churches cast solemn shadows; a national college serves higher education in a country rife with illiteracy.

Across the river broods the low Chaco Boreal, twined with palms, creepers, forests, and lianas. Chaco, to some, means "hunting ground." Lovely, yet menacing, it squirms with deadly snakes, rings with cries of exquisite birds. Butterflies wing among dreadful insect pests. It alternates miasmal heat, bitter cold, and exhilarating autumn days. Vast pasture plains and timber abound. Whoops of cattle-tending cowboys are heard here, as in more settled eastern Paraguay across the country-slicing river. From a Paraguay River steamer travelers look east and west upon starkly different lands, separated by a mere ribbon of water. On the Chaco side, one seldom finds a horizon of more than 200 yards. Behind thicket screens, roam several thousand primitive Indians.



PHOTOGRAPHS BY FENNO JACOBS FROM THREE LIONS

The Face of Paraguay

FACES, like landscapes and language, reveal much of a country. Planter, cowboy, girl with the balanced basket, and Guaraní Indian (above) suggest the people you would meet on an average day in agricultural Paraguay. They typify 1,500,000 others in their California-size country, landlocked between Bolivia, Brazil, and Argentina. Destructive wars and deprivations have engraved sadness on most Paraguayan faces and strewn roadblocks on national progress. But hopeful changes appear. Gossip in the capital, Asunción, deals with industrial development for Paraguay—pending, perhaps, but promising.

The nation's soil is fertile, its food-producing possibilities have hardly been scratched. Waterfalls thunder their promise of electric power. Rich pastures carpet rolling highlands, awaiting more cattle. Paraguayan herds are already substantial. They developed from eight Spanish beasts brought on a tossing voyage from Europe four centuries ago. Beyond pasturelands, thick forests await felling to build a big lumber industry. Already quebracho (ax-breaker) trees supply tannin. Manganese, iron, copper, graphite, mercury, and sulphur await the miner, along with deposits of marble and lime. But lack of coal has slowed industry.

More men (Paraguay encourages immigration) and more capital are needed to plumb the full depth of natural resources. Paraguay has fought two bitter wars during its short history—the last one in 1932—and suffered from crippled finances and the loss of manpower.

Need of better transportation—a problem shared with much of South America—shows up in Paraguay's 1,000 miles of roads, less than 100 miles of them paved highways. A four-year plan anticipates a highway increase to 1,800 miles. A main surfaced road ribbons eastward from Asunción to Villarrica by Caacupé. It will be part of the Pan American Highway system extending to Iguassú Falls on Brazil's border, joining with a completed Brazilian road to Paranguá on the Atlantic coast. Landlocked Paraguay thus would have a road link to the sea.

Asunción and the ocean are tied by the 1,290-mile-long Paraguay River, via the Paraná River (see map). Though it lies inland 1,200 river miles, the capital has the flavor of a seaport. At its docks, men load river steamers with tons of canned meats, citrus fruits, timber, and cotton.

Behind the bustle of commerce an Old World atmosphere mellows Asunción. It perches behind a red-faced bluff, dominating a placid bay protected from the river current. Colonnaded buildings wear their age gracefully. Brightly-clad

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WALLY McNAMEE, WASHINGTON POST & TIMES HERALD

Monarch Butterfly

Sooty, the cat, had finished her sardines and needed just a bite of something special to top them off. A crunchy insect, perhaps. She was rounding the corner of the house toward her favorite spot of October sunshine when what should flutter by but a butterfly. A flash of paw and bared teeth and Sooty was biting into one of the mysteries of science. For she had chosen for dessert one of the thousands of monarch butterflies which scientists have tagged to try to learn more about where, why, and how these yellow and black beauties migrate.

Sooty's fast-acting mistress intervened (above) before the cat downed more than part of a wing. Thus the Arlington, Virginia, girl learned that this particular monarch had flown all the way from Toronto, Canada. Her mother reported the find to Dr. Frederick A. Urquhart of the Royal Ontario Museum (who had banded the butterfly) and one more bit of scientific evidence was in—with an assist from chief researcher Sooty.

Since precious few banded butterflies ever turn up, each one reported tells scientists a little more about their puzzling habits. Of 20,000 monarchs tagged by Dr. Urquhart one year only 125 were retrieved. One of these far-traveling insects apparently fluttered from Ontario to Florida—nearly 2,000 miles—in a mere three weeks. Others were picked up in Maryland and even Texas.

Dr. Charles L. Remington of Yale also has entered the butterfly sweepstakes. His monarchs wear the letters YALE, and finders are asked to report to him.

The migratory monarch *(Danaus plexippus)* can outdistance a running man. Keeping a steady pace—between twelve and fifteen miles an hour—it often travels for days without stopping. It tries to fly in a direct line, but winds cause the familiar zigzagging motion, like a kite in a shifting breeze. Specially lubricated wings shed water like a duck's feathers and protect against storms.

The migration begins in autumn. Millions of monarchs in Canada and Alaska press southward, heading for California, Texas, Florida, and the Gulf Coast. The ones that make it settle by the thousands in southern trees and remain fairly dormant. In early spring the tiny creatures begin to stir. They breed and head for home.

By now gay colors have faded. Wings are frayed. Life is nearly spent. Females lay their eggs en route on milkweed plants and die two or three weeks later.

The pines of Monterey peninsula attract millions of West Coast monarchs and thousands of sight-seers each fall. In fact, Pacific Grove, California, has made itself a sanctuary for the fragile wayfarers, the city fathers standing ready to slap a $500 fine on anyone interfering with the butterfly bonanza.

UMI

PHOTOGRAPHS BY FENNO JACOBS FROM THREE LIONS

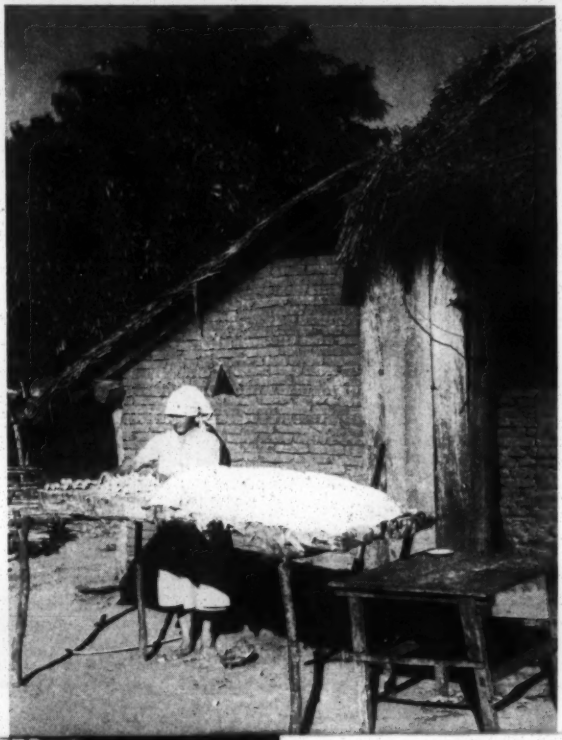
From the Chaco War with Bolivia (1932-35) Paraguay emerged with 92,000 square miles of its territory. Some Chaco area awaits exploration. But visitors try to see the Falls of Guaýra, on the Brazilian border. There the Paraná, three miles wide, roars over a 100-foot-high ledge to pile up in a surging, foaming mass within a deep, narrow canyon. At flood time, Guayra thunders with about eight times Niagara's volume of water.

Airways supplement Paraguay's railroad and river links with the outside. Planes drone from Asunción to Buenos Aires in about four hours, to Rio de Janeiro in six hours. The possibility of embracing a notable international airport looms for Paraguay, as other industries develop. Some 80,000 persons now process agricultural, forestry, and pastoral products for export. Home markets lean heavily on textile output. Workers barely pause to sip traditional yerba maté (above), a kind of tea.

Matches, furniture, cigars, soap, and lumber issue from factories and small shops. Some 400,000 hides stack up annually for tanning. Paraguay usually supplies about 70 percent of the world production of petitgrain oil, taken from bitter-orange trees for use in perfumes. Industry clusters in areas east of the Paraguay River, centering around Asunción and thinning off toward the north.

While Paraguay undergoes a sort of creeping transition, its well-loved old customs rock placidly along. A community's best clothes come out of closets for fiesta days. Sometimes Chaco Indians remember habits that date from before the coming of Spain, dressing gaudily for their dances.

Women mash the tropical mandioca root into a crude flour (right) which provides a starch-rich bread. And deep in the Chaco, bright birds flutter, insects hum, and vampires flit at night—as though new roads and industries were a million years away.—S.H.



CLAUDE JACOBY-PIX

Spain's highest mountains, the 11,000-foot Sierra Nevadas, tower within Andalusia. The area is dry, with extremes of temperature. But caves give protection against furnace heat of summer and winter's chill winds.

A full report on the region appears in the October, 1957, *National Geographic Magazine*.

CLAUDE JACOBY-PIX

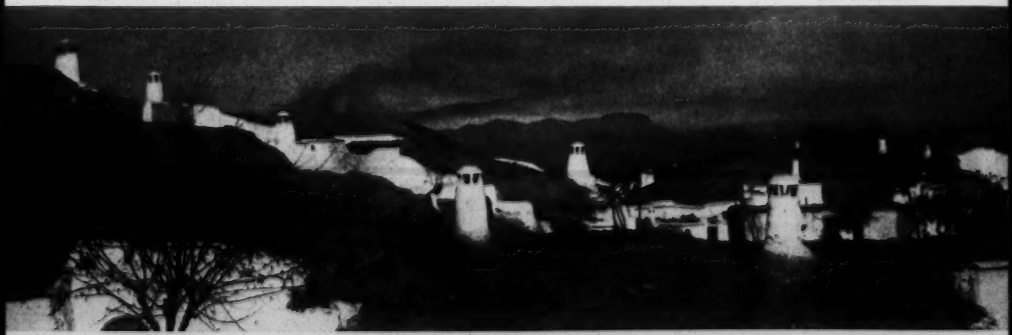
in these underground homes as well.

Guadix, near Granada, houses one of the world's largest troglodyte (cave-dweller) groups. Here 10,000 people live in roughly a square mile of cave homes, with stores, taverns, schools, and churches all below ground. The tiny grotto church, above, thrusts its spire above ground like the chimneys of cave dwellings.

Such cave communities as the one below can be spotted from miles away by the conical white chimneys that rise above subterranean rooms. Arched ceilings and doorways strengthen the caves.

The blood-stirring rhythms of flamenco music were born in the caves of Granada. At night its caverns quiver with frenzied music of guitars and clicking castanets. Gitano girls in flounced skirts tamp out the staccato beat of flamenco rhythms, snapping their fingers like pistol shots while their partners stamp a fusillade in flashing boots. Musicians and dancers, such as the Spanish composer Manuel de Falla and dancer José Greco, come here for inspiration.—K.C.

JACK MANNING-PIX



LUIS MARDEN, NATIONAL GEOGRAPHIC STAFF

Cave Houses of Spain's Andalusia

LIKE to live in a cave? About $14 will buy a small one in the hills of southern Spain. Many a gypsy who tired of nomadic life has settled in this desolate area, Andalusia, digging into soft limestone and clay hills to make a home.

Spain's underground architects often whitewash their front rooms and doorways and set them out from the caves (above) to guard against erosion. Though inhabitants are cave dwellers, strictly speaking, they have little in common with primitive men. Andalusia's cozy caverns are often quite luxurious. Some have as many as 20 rooms, with bright whitewashed walls and tile floors. Others have stone floors or well-tamped earth. Gleaming copper pots made by gypsy metal workers decorate walls and ceilings.

CLAUDE JACOBY-PIX

Some of the more prosperous residents—famous flamenco dancers and singers—have elaborate cave "villas," with baths, telephones and electricity, right. On the other hand, some homes may have a pig sty next to the living room. Some families also keep a stable next to the family quarters.

Sun-scorched Andalusia has beckoned gypsies for centuries. They wandered into southern Spain some 500 years ago, when Moors ruled this area from their prosperous capital, Granada. Natural caves of the region soon teemed with gypsy (*gitano*) communities. Many non-gypsies live

MRS. BRANSON DE COU

jackets, and black brimmed hats. Well-dressed women swish long skirts of red or blue, under embroidered blouses with long, striped sleeves. Corkscrew curls dangle from beneath white cotton bonnets.

The local *klompenmaker* supplies wooden shoes, many beautifully carved. Love-struck young men offer *sabots* in proposals of marriage—for what good is a man if he can't make shoes? Marken boys wear skirts during their first five years (left).

Half a dozen small hamlets shelter Marken's inhabitants. Clusters of small wooden tile-roofed houses stand on flood-proof mounds. Narrow brick causeways join groups of houses to each other and to another mound holding the cemetery. Simple wooden planks may provide crossing over small canals. Automobiles are discouraged by narrow passageways.

Dutch love of cleanliness makes most Marken house interiors gleam like polished sea shells. Brightly-colored walls are nearly obscured by accumulations of dishes, statuettes, brick-a-brac, clocks, pictures, and goblets (below). Figured curtains of red and blue conceal beds in sleeping alcoves high above the floor.

Marken stands on the west edge of a polder designated for draining about 1964. Then the area, if not the people, will wear a new look. The one-time island will be a mere rise on flat farmland.—S.H.

GILBERT M. GROSVENOR, NATIONAL GEOGRAPHIC STAFF

Marken Island

HAMILTON WRIGHT

HIS wooden shoes drum along the cluttered byways of Marken Island. The village baker is early astir with baskets of loaves for awakening householders. Customers look hard at his bread, but ignore his baggy breeches. Such attire is customary in this water-lapped museum community in the Netherlands. Tourists appreciate its well-fostered atmosphere of seemingly unchanging custom, and isolation.

Seven centuries ago, North Sea breakers sundered Marken's natural link with the mainland. Wind-swept waters isolated the flat mile-square abode of 1,500 fisherfolk in the Zuider Zee 12 miles northeast of Amsterdam. Islanders sheltered behind their dikes (below) and lived their own lives. Then the need for new land that has literally shaped much of the physical face of the Netherlands (GSB Jan. 21, 1957) began to affect Marken. In 1932 a 20-mile dam barred North Sea waters from the Zuider Zee. The latter became a fresh-water lake—IJssel Meer. Polders, blocks of man-made land, began to fill in the lake.

Just last October, a dike-causeway rejoined Marken to the mainland near its sister show-place village of Volendam. Technically, the Markers are no longer islanders. Yet they keep wearing the wooden shoes and flamboyant dress that outsiders associate with all the Netherlands.

Many outsiders wonder if the villagers perpetuate their charming costumes purely for profit. Actually, they continue to wear centuries-old attire even when winter bars tourism.

Marken men clomp about in baggy black breeches, high black collarless

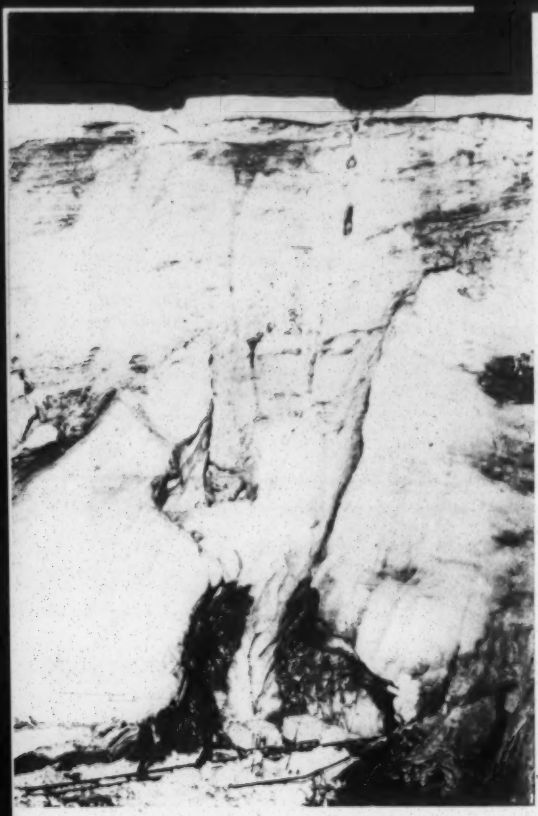
MCFALL KERBEY

the summer of 1956 was eaten with relish last summer.

To store gasoline, all you have to do is gouge a basin out of the ice floor, pour in the gas, cover it with a light layer of plywood, seal it with slush ice, and leave it. A year later, you can siphon off the gas, put it in your tractor, and buzz off. It isn't even diluted; water that trickles in simply turns to ice crystals. "I'm convinced we could store gasoline in the Arctic for years and it would stay fresh," says Colonel Elmer F. Clark, who for three years was commander of the task force.

That's only the beginning of the tunnel's usefulness. Equipment—vehicles, weapons, machinery—can be stored during winter, then driven out the next summer without so much as an oil change. Whole dormitories for workers or troops could be fashioned within the icecap. In such barracks, men would have little trouble keeping warm. Although the temperature down below remains a constant 16° winter and summer, men often work comfortably in shirt sleeves. Tunnels would be built to allow fresh air to be forced in and stale air exhausted.

Another Army Engineer dream is a complete under-ice subway system. Such a transportation web would solve the difficult navigation problems faced by topside tractor caravans. On the icecap, drivers must combat "white-out" (loss of depth perception due to minute ice particles in the atmosphere that diffuse sunlight), skirt dangerous crevasses, and pick their way without landmarks. A subway would enable large loads of cargo to be mule-hauled easily from one location to another. And a man leaving the Thule base to report to a weather station far out on the icecap would simply hop aboard the nearest local of the Arctic Rapid Transit.—A.P.M.



Greenland's Army Icebox

Photographs by National Geographic Photographer J. Baylor Roberts

The great Greenland icecap, whose wind-blown surface proved so inhospitable to early explorers like Robert E. Peary, now reveals a new usefulness to man.

Military pioneers who man the airfield, radar posts, and weather stations at Thule, 700 miles north of the Arctic Circle on Greenland's northwest shoulder, have discovered that by burrowing into the steep flank of the glacial mass (left) they can carve out a well-protected sanctuary. Such a cavern provides not-so-cold storage for men and materials. The Army Engineer's First Arctic Task Force has sparked this experiment. Its soldiers and skilled civilian specialists constantly explore ways for men to live in the Arctic and like it.

One answer is the ice tunnel. Three years of work, done during the comparatively warm summer months, produced an under-ice honeycomb of tunnels, vaults, and passages, extending one-tenth of a mile into the glacial cliff. A narrow-gauge railway, similar to ones used in anthracite coal mines, has been laid down along the main tunnel. Engineers push the empty cars into the tunnel mouth, above, and up the gently sloping tunnel floor to the excavation site. Here cars are filled with chunks of ice "spoil" and roll out by gravity to be dumped.

"Mining" a large room 250 feet under the icecap is just like mining hard rock, say the Engineers, only colder. A chain-saw mining machine trundles up to a wall of ice, raises its tungsten teeth to ceiling level, and cuts a horizontal gash along the ceiling line. The machine backs off. Its teeth sink to floor level and make another cut. Two vertical cuts follow, describing a rectangle in the wall. Charges of black powder are tamped into several drilled holes in the rectangle. With a shattering explosion, hundreds of pounds of crystal blue ice crash down like giant ice cubes cracked loose from a refrigerator tray. Working by the light of a bare electric bulb, the crew shovels the tinkling, flashing ice chunks into the cars.

When Dr. Melville B. Grosvenor, President of the National Geographic Society, visited Thule recently with Staff Photographer Joseph Baylor Roberts, he was conducted through the spreading tunnel. He kneels (right, below) in one of the branch tunnels to inspect a small chain saw used for work in close quarters.

The Engineers explain what they have learned already from tunnel excavation. Meat, poultry, and vegetables can be kept for at least a full year, probably much longer, in such a giant deepfreeze. Food placed in pits dug in the tunnel floor

NATIONAL GEOGRAPHIC PHOTOGRAPHER J. BAYLOR ROBERTS

Greenland's frigid wastes conceal a new-found usefulness